V.—*Ornithology of the Moroccan "Middle-Atlas."*

By Captain Lynes.

(Plates III.–XII.)

Part I.—Itinerary.

We, in the Navy, who in peace time have chosen to supplement our professional duties by the more active pursuits of the field, have sometimes found their curtailment, caused by the conjunction of Neptune and Bellona, rather trying to the internal economy; it was therefore not entirely mere pleasure-seeking that, the Armistice having closed the more serious pages of the war, led me to give up command of the 'Warspite' and obtain permission to get a little nearer the sun.

The companion who started with me, also in search of a "cure," had scarcely arrived at Gib. than he was recalled to England, and in consequence it was alone, with a moderate equipment, little more to recommend myself than an introduction to our Minister for Morocco, and feeling rather like a bird newly-escaped from its cage, that I landed at Tangier last 12th of April.

Morocco had been chosen for its climate and accessibility, it was near home in case anything unexpected happened, and our meagre knowledge of its Natural History * afforded ample scope for some useful work among the Birds.

But, save for a vague sketch programme based on the probability of the Great-Atlas and Central parts being inaccessible, and that therefore, if the non-shooting difficulty could be overcome, to follow up Mr. Meade-Waldo's work † in the Forest of Mamora would present the best chance, I had about as much idea as the man in the moon as to the possibilities of travel, where to go, or how to get there.

However conspicuous the fact that one may avoid being quite a Mr. Verdant Green by "reading-up" the country

* *Vide* Appendix I, "Notes on Orn. Bibliography of Morocco."

† *Vide* Ibis, 1905, p. 161.

before setting out on the trip, I think most of us often find, on or after arrival, that "the one thing" one might and should have read was absent from the literature so carefully waded through.

And so in my case: the works studied had been those likely to provide news about Natural History; all, except the mere bird-lists, written before, some very long before, even the Algeciras Conference of 1906, and though I do not for a moment regret the notes culled from the works of Hooker, Segonzac, Gentil, Pitard, and others, my general impression of Marocco before landing there, was that of the old Moghreb: heads on spikes around the city-walls, slavery and torture, vast camping equipments and retinues, Cherifian letters, monas, etc.

Had, for instance, Mr. Consul McLeod's excellent paper in the Journal of the R. G. S., August 1918, or even some of the French-Moroccan journals been among the literature studied, I should have realized how far the past eight years' policy of Général Lyautey, the maker of modern Marocco, had evolved order out of that mediæval chaos, and should in consequence have brought out a rather better equipment, and perhaps commenced work earlier in the season, both of which would have been advantages.

However, at Tangier I was soon put upon the right track. Sir Herbert White most kindly gave me not only letters of introduction, but suggested the possibility of my being allowed to visit the recently opened-up forests in the central parts of Marocco; and, further fortified in this new plan by help from Mr. W. B. Harris, I went on at once to Casablanca by steamer, and thence by rail the following day (14 April) to Rabat, where my cause was taken up by Mr. Vice-Consul Lomas, whose kind and invaluable help all through my stay in Marocco I recall with the deepest gratitude.

Rabat, lying *vis à vis* across the Bou Regreg River, with Salé, the old lair of the "Sallee Rovers," was gay with bunting; the new Governor-General of Spanish Marocco had just arrived to pay his State visit to Général Lyautey.

In consequence, before I could present myself at the

Résidence Général a few days elapsed, which enabled me to make a few rambles up the Bou Regreg estuary and to spend the 20th of April in the north-western edge of the Forest of Mamora near Kenitra, an easy hour's train journey from Rabat.

Considerable migration was in progress near Rabat, but markedly less in the Forest, pointing clearly to the coast-line being the birds' "high road." The most numerous migrating species noted were Whitethroats, Willow Wrens, Swallows, Redstarts, and Woodchat Shrikes; but Garden, Blackcap, Orphean, and Subalpine Warblers, Pied Flycatchers, Wheatears, Sand-martins, Bee-eaters, Rollers, and many other species were well represented in the passing throng.

Among breeding birds, the Chaffinch, Greenfinch, Goldfinch, Serin (with young abroad) and Spanish Sparrow were conspicuous in the orchards, as was also the Bulbul. But none of the other "African" Passerines (*Argya*, *Telophonus*, *Diplootocus*) were present; the Grey Shrike (apparently *algeriensis*) had been plentiful on a waste part of the plain between Casablanca and Rabat, but from later observations and information, I think in this part of Marocco one should probably go to the "Zizyphus zone" (see Plate XII.) to find the Bush-Babbler and Tschagra, and to the southern and south-eastern glades of the Forest of Mamora for the "*arabs*" Bustard, Guinea-fowl, and Francolin.

Near Kenitra, the Forest of Mamora consists of very moderate-sized cork trees, varied by wild pear and sapling corks. Open glades, with occasional "maquis" of cistus and palmetto, are frequent, and the light sandy soil is everywhere clad with a luxuriant plant-growth, various bright-flowered Compositæ predominating (see Plate X. *b*).

The bird-life was disappointing for so nice-looking a place. The "maquis" seemed to hold scarcely anything. I found nests of Black Kite, Long-eared Owl, Raven (*C. c. tingitanus*), and Blue Tit (*P. c. ultramarinus*); Chaffinches, Great Tits, Orioles, Serpent Eagles, Wood Pigeons, perhaps Hobbies, etc., were likely breeders; but Creepers, Nuthatches, Coal Tits, Jays, Green Woodpeckers, and many

other species, found later to be so abundant in the Middle-Atlas forest, seemed to be entirely absent.

From all accounts, the nature of Mamora here is fairly typical of its greater part; nevertheless an eight-hour ramble like this, in its edge, cannot be regarded as more than a first impression of so great an expanse of "forest."

His distinguished guest having departed, Général Lyautey received me, and with the greatest kindness invited me to visit any of the "Postes Militaires" that I wished.

Commandant de Beaucoudrey, (acting) Head of the "Département des eaux et forêts," generously offered to take me in his motor-car for a trial trip to the forests of Azrou and Ain Leuh: if, as a result, these districts should seem to me worthy of a prolonged stay, I could return and settle down there.

Leaving Rabat P.M. the 23rd of April in one of those (to me) amazing Ford cars, which despite its four years' hard work carried us nobly over the up-country obstacles when obliged to leave the main road, we spent the night at Meknez, and the following afternoon bade *au revoir* to Colonel Colombart and Commandant Lefevre, our hospitable hosts, and proceeded southwards to Azrou.

The physical features of the country traversed having been more or less indicated in Plate XII., it is unnecessary to add more here. On the plateau of El Hajeb we were treated to a long cold thunderstorm, but when we passed the camp of Ito at its highest point, our discomforts were more than recompensed by the glorious view that opened out ahead. To the south-westward, as far as eye could stretch, lay a tumble of steep-sloped mountains bathed in distant evening sunlight; thence to the south-eastward, in middle distance, the serrated crest of the great forest, under a lifting canopy of indigo cloud, frowned sombrely down from its two-thousand foot advantage on the green expanse of the Tigrigra valley. Twenty minutes later we had crossed the valley and were at Azrou, with the Middle-Atlas rising, so to speak, from our back door.

Suffice it to add that during the next three days we made

short excursions on horseback from Azrou and Ain Leuh into the forest, every moment of which brought some new delight, ornithological or botanical, and that we returned to Rabat with the desire strong in my mind to return to the Forest as quickly as possible in order to take a full stock of its treasures during a prolonged stay.

Again, thanks to the kind arrangements made for me by Général Lyautey and his Departments, three days later (1st of May) found me leaving Rabat by train with equipment for a long stay at Azrou, where I arrived by *Camion postale* from Meknez the following day, and remained until the 17th of July, an extremely happy ten weeks, thanks to the never-ceasing interest of my work and the charming society of my French friends, Capitaines Bousquet and Chaplet, and the officers, who graciously made me an honorary member of their Mess.

Here my time was spent making daily excursions into the forest and its dominating "Plateau"; the Tigrigra valley offered comparatively little of interest, though the river often supplemented our menus with delicious brook-trout up to a pound in weight.

In June, while the advance column was operating in the Upper M'louya territory, a vedette encampment established by Azrou on the southern edge of the plateau near Jebel Hebbri, enabled me to spend several nights under canvas there, enjoying the hospitality and companionship of Sous-Lieutenant Leriche, and (during the days) to take better stock of the Plateau than would otherwise have been possible.

Night work was nowhere possible, for we were close to the mountain encampments of the still hostile Berber tribes: even in the day-time it was never permissible to go out without an armed guard of "Mokhraznis" or "Goumeurs," besides which I had been unable to recruit a native taxidermist, so that the working hours available for field-work were curtailed by much time spent at the skinning-table and over the various other collections.

My peregrinations covered some ten miles length of Forest above Azrou, many square miles of "Plateau," including two

traverses, to Timoudit and back, and the two days' trial trip to Ain Leuh ; and they leave me confident that the territory explored was thoroughly representative of the northern parts of the Middle-Atlas as far to the eastward and westward of Azrou as the vegetation and physical features remain similar, also that, with the exception of Owls, my observations and collections fairly gauged the Resident and Summer bird population.

I cannot close this "Itinerary" without recording my grateful thanks to Messrs. Rabino and Selous, of H.M. Consular Service, and to Lieutenant Poznanski, who, in addition to those gentlemen already mentioned and many whose names would make a very long list, so generously gave their ægis and help to my plans; nor can I ever forget the hospitality and interest in my work of Général Bertrand, commanding at Meknez, and his staff.

It was indeed delightful, wherever I went in Marocco, to breathe again the atmosphere of French "bon camaraderie," that remains one of my happiest remembrances of Dunkerque and the War.

Part II.

The "Middle-Atlas."

(Attention is invited to the maps in Plates XI. and XII.)

Owing to the hostility of its Berber inhabitants, who never in past days recognised the authority of the Sultan, and even now, that of the French only on their fringes, the Lesser-Atlas and Eastern Great-Atlas mountains have remained almost unknown to Natural Science up to the present day, while the rest of French Marocco has been either "skimmed" or comparatively well worked.

The Riff Chain, which covers practically the whole of Spanish Marocco except a coastal strip, is equally unexplored, but differs from the French zone in that it seems likely long to remain so, unless some naturalist gets on the soft side of Raisuli and the other Riffian Sheiks.

During the eight years of French control much has been

done in Central Marocco by the Survey Departments (incidentally considerably lowering many of the peaks, *e. g.*, Jebel Aiachi from circa 14,100 to 12,300 feet, etc.), and in some dozen French works * on Marocco the geology of this region is discussed, though admittedly with much speculation owing to scanty material; but in works accessible to the general public (if anywhere?) its Biology, save for a little economic botany, remains as yet a blank.

It is thought, therefore, that a slight digression from our own particular branch will here be permissible, and that the reader will find the following little résumé of what has been published up to date about the Physical Geography of the Middle-Atlas of use in following later, a few speculations on the wider subject of Geographical Distribution in Mauretania.

(a) *Geology.*

[I wish here to acknowledge the kind help of Mr. Campbell-Smith, of the British Museum, to whom I submitted my small collection of minerals, but, alas! no fossils.]

Broadly speaking, the Middle-Atlas consists of the chain of mountains, mountain masses, and high plateaux extending in a north-easterly direction for some 220 miles from (about) Demnat in long. 7° W.; terminating, to the eastward in the valley of the Middle M'lonya, and to the northward near Taza. For its western 80 miles, viz., from Demnat to the water-parting $\frac{\text{O. el Abid}}{\text{O. M'lonya}}$ the chain is linked to the Great-Atlas, and appears to be more a tumble of mountains and mountain spurs accessory to the latter, than a separate chain†.

The Great-Atlas then bends away about 15 degrees to the southward, while the Middle-Atlas continues for the remainder of its 140-mile easterly stretch, as a chain of its

* Louis Gentil, "Le Marocphysique," 1912, and several papers in "Comptes rendus," 1915, 16; other authors are Rohlfs, Pitard, Bernard, De Foucauld, Segonzac, etc.

† In similar manner the complementary chain called the "Anti-Atlas" is linked to the Great-Atlas on its south side, and French geologists consider the Lesser- and Anti-Atlas as fundamentally the same earth-crinkle.

own, clearly separated from its sister by the ever-widening valley of the O. M'louya. The final 60 miles of the chain is spread out in a quadrangular mountain expanse of some 1500 square miles, one main line of peaks running N. 40° E. to form the eastern terminus ; another, containing the dominant massif of Moussa on Saleh (12,425 feet), curves gradually to the northward, and forms the northern terminus of the chain near Taza.

It is thought that, as in the case of the Great-Atlas, the first upheavals of the Middle-Atlas occurred during late Primary and early Secondary times, and that later, the basal plateaux of Jurassic formation emerged from the sea, placing above water the whole range with its present trend as we now know it.

Elevation over perhaps all Marocco continued, and there is good evidence to show that in Miocene times, all the flanking hills and plateaux (including the plateaux of El Hajeb and Oulmes) to the northward of the Middle-Atlas were also above water, their bases washed by a sea that connected the Mediterranean and Atlantic—and separated from Africa the Riff chain, at a time when the latter was joined to Europe.

The theory is, briefly, that the Riff belongs fundamentally to the Andalusian Sierra Nevada, that up to (probably) Pliocene times the two were connected by dry land via Apes Hill—Gibraltar, in the West ; and in the East (doubtfully ever above water) via Melilla—Alboran Island—Cape de Gata ; and that the Mediterrano–Atlantic connection, admitted as having existed at this period, was by the "détroit Sud-Rifain" of French geologists, which, it may be noted, equally cut off both the Algerian Tell and Middle-Atlas from the Riff.

This phase had been preceded by one in which the Sierra Nevada was itself isolated from Europe by the "détroit nord Bœtique," and was succeeded by that which simultaneously (in geologic chronology) closed the "détroit sud-Rifain" and opened the Straits of Gibraltar, so as to group the land and sea areas as they exist to-day.

Throughout the Middle-Atlas, the distinguished French geologist, M. Gentil, has discovered evidences of much Tertiary or "Recent" volcanic disturbance.

My personal acquaintance with the Plateau showed that its surface, at least as far south as Timoudit and for many miles around Jebel Hebbri, is composed almost entirely of volcanic tufa and basalt; a vast, scarcely undulating flat, broken only by sundry "Volcanic Kopjes" and "Craters," the former chiefly collected towards the northern edge.

The "Volcanic Kopjes," of which Jebel Hebbri, standing some 500 feet above Plateau level, is the largest, are cones, nearly flat-topped or with shallow imperfect craters.

The "Craters" are without lip or any sign of ejected materials, and so, presumably, the result of subsidence; their sides, often very steep or even vertical, are of hard basalt of columnar or trap formation; some are as large as 500 yards diameter at Plateau level, and 300 feet deep; the smallest are mere "pot holes," 30 yds. × 20 feet (*sic*).

Beyond Timoudit, whose fortress is perched on the summit of a scoria-sided volcano which rises from an exposed limestone base to about 500 feet above the valley of the Ouad Guigou, I did not go: but viewed from the fortress, it was clear from the appearance of its northern face that that part of the main chain of the Middle-Atlas is largely composed of limestone, and lacks the volcanic elements of the Plateau, except, perhaps, just where its base meets the Plateau.

Two other minor features worthy of note in the Range are, (*a*) the "Mamelons" in the Tigrigra Valley at the base of the Range, (*b*) the "Terrace" on its North Slope.

The "Mamelons" are a number of separate little hills up to 500 feet high, of two types: the "mound," an unbroken rounded hummock like an apple-pudding, and the "rocky," surmounted by small crags, dropping in screes on the north and west faces down to their bases: some abut so intimately on the "North Slope" as almost to form a spur, others stand clear on the floor of the valley (see Plate III. *b*).

They seem to be formed of Primary rocks, slates, and schists; but I can advance no theory as to their origin.

What I call the "Terrace" is really a single row of microscopic plateaux at a half to a third of the way up the "North Slope."

Commencing at Azrou, where one of them is earmarked as the site of a pulmonic sanatorium, these little plateaux extend to the westward, it appeared to me, at any rate as far as Ain Leuh.

Were it not for the numerous gullies, now carved deep and wide in the Slope, many of the "Terraces" would be continuous; and since they divide the limestone outcrop from that of the clay-slate and old rock below, it is conceivable that this feature is an ancient geologic formation of the "beach" type, so that the name by which I have chosen to distinguish it from the main "Plateau" may be less inappropriate than at first glance.

The "Terrace" has soil for a good crop of wheat, but only those parts near the Military Posts are cultivated, the remainder can only, as yet, be used as pasture at "shepherd's own risk"—quite a real risk, for even during my short visit the Berber mountaineers made several raids, resulting in loss of stock and casualties among the herdsmen.

I may here say that I could see neither in "Terrace" nor "Mamelons" any analogy to the "escarpment" and "boulder-mounds" described by Maw at the base of Great-Atlas, south of Marrakech.

(b) *Physical and Biological.*

To the traveller entering the Lesser-Atlas from the Atlantic coast, by the "Route Impériale" through Meknez, nothing is more apparent than that on arrival at Azrou, he is about to enter a quite new type of "country."

After having made his first step-up from the maritime plain (or "Meseta"), except for the absence of its cork-woods, the Sebu marshes and the narrow "Zizyphus zone" of the first foot-hills, he will find in the Fez-Meknez plain little of novelty; the same flat wastes of palmetto scrub, the same types of cereal cultivation, and composition of floral tapis, with bird-life corresponding to the similar environment,

The surrounding hills have precisely the same monotonous aspect, common to the more arid parts of the Mediterranean littoral.

The second step-up on to the Plateau of El-Hajeb will produce trifling further change compared to what might be expected from the nature of its stony pastures, but a few of the lower birds—such as the Stonechats, Bee-eaters, and Lesser-bustard, have dropped out; the Stork, Corn-bunting, Crested-lark, and Lesser-kestrels remain ubiquitous as hitherto; Calandras "scream" as over the lowland wastes, and no new forms occur.

The dip of the Tigrigra valley still brings little novelty, but with the "Mamelons" at the base of the Middle-Atlas all commences rapidly to change.

The "mound" type of Mamelons are mostly clad with a monotone of genista scrub, growing close and wiry, like bilberry, and for all the world resemble one of our sombre Northern moors, until midsummer's inflorescence throws a mantle of brilliant yellow over the whole, and lends its charm to the aerial song of the Tawny-pipit—the sole feathered inhabitant. Stretches at the base, in unequal contest with the torrential rain-storms, fail to retain the scantiest soil, and are bare to the rock or mere shale-slides.

The "rocky" type of Mamelons are much more diverse both in plant and bird life; Neophron, Kestrel, and Raven nest in the largest (25 feet circa) crags, the Little Owl in the smaller ones, Moussier's Redstart and the Blackchat among the boulders; the Redleg prefers the dwarf ilex scrub, and *Prunella* on the screes, while the Linnet and Cirl-bunting find nesting sites in the stunted juniper shrubs that grace what passes here for soil.

Here, then, lies the borderland between the old and the new zones: Azrou's ancient mud walls, like those of El-Hajeb and the cities of the plain, abundantly supplied with nesting holes and niches, fail to attract their swarms of Lesser-kestrels, though a few Storks find here their "Ultima Thule"; the monotonous chortle of the Corn-bunting is heard no more, and the Crested-lark begins to be replaced by the Wood-

lark. Here, too, we meet for the first time the Black-chat and Tawny-pipit, and stray examples of Seebohm's Wheatear, while overhead the Golden Eagle and Lammergeier sailing out from the mountains in quest of food, tell of the riches beyond.

Overhanging Azrou and its "Mamelons," the Northern Slope of the Lesser-Atlas with its abrupt 2000 feet incline, median "Terrace," and occasional crown of precipitous crag, would be a feature sufficiently striking to the south-bound traveller, even were it bare or clad only with the poor brushwood recently passed by on the Plateau of El-Hajeb: but, clothed as it is for its upper two-thirds and crested with dense forest, he cannot fail to observe that he is about to enter a type of "country" quite different from anything between it and the Atlantic, or for many miles to the northward.

Botanically, the Forest is essentially "cool temperate." Ilex (*Quercus ilex*) forms the matrix of the tree-slope, good 40–70-foot trees up to 5700 feet, above which altitude they dwindle in size and number, and soon peter out altogether.

Cedars (*Cedrus atlanticus*) commence to intersperse themselves at about 5200 feet (once on a time certainly lower), at 5600 feet are at their zenith of size and beauty, magnificent trees of 120 feet and more; thence to the crests they increase in number but lose somewhat in stature, until the species remains the sole representative of tree-growth, and spreads on to the Plateau, but there only to crown the "volcanic kopjes" or line the walls of the larger "craters," for up there the Cedar seems to abhor a level surface.

As in Europe and Asia, the forests of Marocco have suffered much in the past from the unfettered toll of the aborigines; it is grievous here, in the heart of the Cedar zone, to see the number of dead monarchs standing and lying in wasteful decay, their gaunt barkless trunks and stag-horns the whiter for the black scars of fires lighted at the base in hopes that, perhaps, one in three would thereby be brought to a fall. However, the forests are now being judiciously exploited and preserved by the French administration, and much of the fallen timber that is not too rotten is being utilized,

but the woodcutters have always to be guarded from attack, and enormous areas of forest, the safe retreat of the hostile Berbers, still remain economically inaccessible.

Curiously, despite the quantity of dead cedars, full of holes and crannies, very few birds seem to care to nest either in them or in the dense foliage of the living trees, the Ilex has almost exclusive preference.

Interspersed with the Ilex occur small belts and groups of Spanish deciduous oaks (*Q. bellota*), some with fine straight 50-foot trunks overtopping even the largest of the Ilex.

With a few maple and junipers (*Juniperus phœnicea*) in the upper, and pigmy ash and parasitic ivy in the lower zone, the census of tree-growth of the Forest is about completed.

The forest undergrowth (besides, of course, saplings of the trees) consists in the Ilex zone, mainly of Laurustinus and Holly, with occasional Viburnum and Pyrus bushes, and a knee growth (where stones permit) of butcher broom, etc.; while with the cedars up to their ultimate limit, especially in the burnt tracts, (although the live trees are seldom so packed as to "shade-out" undergrowth away from the proximity of the bole), are generally associated thickets of the beautiful *Cytisus battandieri* *.

The *clarières* and *cols* are attractive with bushes of many kinds. Hawthorn predominates all through the Forest zone up to the brink of the Plateau, and is a favourite host of the red-berried mistletoe (sometimes too much so for its life); of other species, honeysuckle, bramble, holly, cistus, cherry, locally wild vine, and several *Genistæ* are among the most prominent, but the majority drop out some way before the Plateau is reached.

Of flowering plants, a large pink pæony, abundant throughout the Cedar zone, must be acknowledged Queen; *Cytisus battandieri*, with large drooping racemes of golden yellow, becomes a wealth of colour and fragrance in mid-

* Special to Moroccan Atlas.

June, Solomon-seal, grape-hyacinth, and numerous other bright Liliaceæ, the hare-bell, and a few other shade-lovers form the bulk of the forest's floral adornments; while, as might be expected, the clearings have also a selection of "cosmopolites" from the plains below.

In the upper Forest zone, the flanks of some of the gullies are too steep and rocky to support more than a minute vegetation; and the natives use these clearways largely for going up and down the North Slope, but the "paths" can only be so called by courtesy, and the pedestrian may far better wander judiciously through the forest than keep to such a *via dolorosa* of stones and boulders.

Above Azrou are numerous springs issuing between 5000 and 5600 feet; but then, Azrou is celebrated for its "*sources*"; for even in these vegetation-clad mountain slopes a perennial water-supply is accorded all the customary reverence of dwellers in a thirsty land. Bird-life is abundant, and at the moment of first entering the Forest we feel almost transported to North Europe. Here are Chaffinches, Robins, Wrens, Missel-thrushes and Blackbirds, Jays, Creepers, Tits, Pied and Spotted Flycatchers, Redstarts, and other northern species in the greatest profusion; the racial characters that distinguish practically every one of these southern forms are in many cases too subtle to detect in the field (some not too easily at the "table"!).

But a Roller screams; overhead, a pair of Ravens are mobbing a Black-kite; a barking and crashing in the brushwood discloses the hasty retreat of a band of Barbary-apes, the lights and shades are tropically intense: the sounds, even the notes of some of our pseudo old friends are new, and we are recalled to the South and reality.

In some parts the "North Slope" gives way to the Plateau quite abruptly, but for the most part there lies between the two an attractive zone, varying from a half to one mile or so of "Barrens" (see Plate VII.) and/or "Crest-mounds." The "Barrens" are open stretches of stony, mixed volcanic and limestone ground, thickly clothed with grass and herbage, much studded with hawthorn bushes towards their northern

edge, and with clumps of cedars deficient in undergrowth on some of the more rocky ridges. The "Crest-mounds" are a jumble of giant midden-like mounds of dark earth profusely mingled with limestone boulders and stones, half-clad with hawthorns and small Ilex trees and bushes. But, attractive as it looks, this zone has comparatively little wealth of bird-life. Woodlarks are very numerous (but no Skylarks or Shorelarks). Rock-sparrows favour this zone; these, and a few Tawny-pipits are the chief inhabitants of the more open parts: the cedar clumps, however, retain some of the forest species and add the Hoopoe and Starling in considerable numbers. Here, with the first streaks of dawn, foxes, civets, boars, etc., may be seen making for their forest lairs after a night on the "Plateau."

The "Plateau," save for that of its volcanic kopjes and craters, is devoid of tree-growth. In spring and summer, with the exception of the few groups of protruding boulders, and the lowest parts of the long sweeps that have retained winter's rain and snow until too late in the year for Nature to clothe them, the whole expanse is covered with rich pasture. Everywhere the ground rings hollow to the tread: there must surely be impervious rock not very far down? in order to hold up the "dayas" so late in the season—some indeed, all the year round (see Plate VIII.).

On the Plateau itself, Seebohm's Wheatear, Atlas Shorelark, and Skylark abound, and in summer practically *coila tous*! save for an occasional Tawny Pipit or Quail; in winter, Snipe and Wildfowl are found there. Jerboas honeycomb the Plateau with their holes.

The bird-life of those "Volcanic kopjes" and "Craters" which possess tree growth is much the same as that of the Upper Forest and "Barrens;" it depends somewhat on the amount of undergrowth, but the Raven, both the Woodpeckers, Hoopoe, Moussier's Redstart, Creeper, Spotted Flycatcher, and Coal-tit, are almost certainties; and if the undergrowth is good, add the Blackbird, Robin, Wren, and *Hippolais polyglotta*.

On the 29th of June we visited a large "daya" on the

Plateau, overshadowed by the Northern Crest-hills, here composed of limestone and rugged in the extreme.

The lake lay in a shallow circular depression of about 25 acres in extent; its water was clear, at the deepest only just above the stirrups of my companion who rode across the lake, and the bottom, save for a thin carpet of loose (? ligneous) matter, quite firm.

It was a lovely picture at sunrise; Ruddy Sheldrakes and clamorous parties of Stilts, alarmed, flew disconsolately over the lake adding their bright contrasts of colour to the carpets of white Water-crowfoot, pink Polygonum, and delicate greens that varied the dark mirror surface.

Out near the middle lay a small islet of reed-growth which sheltered a few Coots (*F. atra*) and Dabchicks, probably breeding there: but despite the assurance of a recent visitor that we should find here "toutes espèces d'oiseaux," a single duck too far off to diagnose (but ? *Marmaronetta*), completed the list of the daya's feathered inhabitants. Curiously, neither Stilts nor Sheldrakes showed signs of breeding, past or present; all were adult.

Some "Volcanic Kopjes" are thickly crowned with cedars; others, besides lacking trees, refuse to provide soil enough to more than half-clothe their slopes with herbage. Such a one is Timoudit.

The Craters are curious: the large ones contain cedars, fine trees where the soil is sufficient, and their roots are well below the rim, but the poor things to whose lot has fallen a more exalted position reach the brink only to meet the bitter storms of winter in full violence, and in consequence are splay-topped and tortured in appearance.

So cleanly are the "Craters," as it were, "scooped out" of the Plateau that unless some of these bizarre cedar-tops protrude, no suspicion of the existence of "a hole" occurs to the traveller until he stands on the very brink of the pit.

One remarkable crater near Jebel Hebbri is exceptionally abysmal, about 250 yds. diameter at Plateau level and (judged) not less than 300 ft. deep. Ninety per cent. of its side surface is vertical; there is only one difficult, but possible

scramble by ledges down to the blunt-coned talus at the bottom.

A few cedars rooted in the upper ledges protrude their weather-beaten tops; nearly all the interior except the vertical is thickly clothed with shrub vegetation, species varying noticeably according to sunny- and shady-side of the pit.

In the cliffs (on the 29th of June) were breeding-colonies of Black Ibis (*Comatibis eremita*), Choughs, Kestrels, and Starlings; Alpine Swifts were swirling round the rim, and it seemed almost uncanny to hear a Blackbird singing at the bottom of the fearsome pit.

Beyond Timoudit, the Plateau extends many miles to south-westward and westward, in which direction cedars are visible on the horizon, while to the south-eastward the "Route" soon ascends to cross the main chain of Middle-Atlas peaks. Except for a few, rather poor, patches of woodland on one of the northern slopes of these peaks the general aspect of the Chain, as viewed from Timoudit (my furthest south), appeared stony and bleak.

Speaking generally, the *facies* of all life in the Middle-Atlas is essentially a "cool temperate" one. One interesting feature is the long or slender bills of some of the bird-forms as Skylark, Shorelark, Robin, Nuthatch, Missel-Thrush, etc.; another, apparently, is the rarity of migratory bird-passage through the longitude of Azrou.

Climate.—Up to midsummer except for two rainy days in the first week of June, the climate was perfect: dry, azure skies, hot sun, cool or cold at night. For eight days at the Solstice (19–26 June) occurred what I was told is an annual phenomenon: each day began hot and cloudless as hitherto; then, about midday, the light northerly breeze dropped and gave place to a southerly one, clouds formed from south to west, and about 2 P.M., preceded by a fall of temperature (which the winged insects invariably accepted as a warning to take cover), there commenced a violent storm of lightning, thunder, and rain or hail, lasting from three to seven hours. Then peace returned, but the succeeding nights, especially

on the Plateau, were bitterly cold. Some of the storms were terrific, typhoon-like in their deluges. The hailstones were often of special brand, ranging from Firecrest's egg size to great lumps of ice as big as a Hawfinch's egg. It was very desirable, to say the least of it, to take cover when these little trifles were coming down—they hurt even on one's shoulders—but for the poor creatures who could find no shelter! Just before one of these hail storms I found a Whitethroat's nest containing four eggs, out in the open; the storm lasted half an hour, then I went to look at the nest; two of the eggs were smashed and three big hailstones lay on top of them. I thought the nest looked deserted before, but do not believe the bird *could* have saved the eggs by covering them without being killed or badly hurt herself. Subsequently, I rather expected to come across more such catastrophes, but didn't.

These diurnal midsummer storms are mountain phenomena, and rarely extend more than a few miles beyond the Middle-Atlas; this year, however, some of them reached even Meknez, but their local nature is well illustrated by the fact that while Azrou had eight days of the storms, Ito, six miles distant, had only four. During these four days, four inches rainfall was measured at Ito; probably Azrou had at least three times as much in her eight days, but no register is kept there.

With regard to temperature; that of Azrou is probably about the same as Ain Leuh, viz.:—

March 1919	Av. daily max.	°Fahr.	62	Av. daily min.	40
April „	„		68	„	44
May „	„		79	„	51
June „	„		81	„	57
July „	„		92	„	63

(Figures kindly given me by M. le directeur de l'Agriculture at Rabat.)

As for the winter; it is only necessary to see the masses of lichen on the trees in the forest to form an estimate of its climate. The total annual rainfall in the Middle-Atlas averages over thirty inches.

Part III.

Results and Conclusions.

The Ornithological novelties, *Sitta c. atlas*, *Erithacus r. atlas*, and the breeding of *Eremophila a. atlas* and *Parus ater atlas*, are perhaps smaller "results" than might have been expected; on the other hand, to fill in a blank area on the (Ornithological) map of Marocco, to extend the range of some of the subspecies as Coal-Tit and Shore-Lark, hitherto known only in the Great-Atlas, and others as the Skylark, not known to breed in Marocco, to confirm certain diagnoses founded on small material, and to add some grist to the mill of museums from which we enjoy many privileges, is, I feel, ample reward (or excuse!) for my pleasant holiday.

Before passing on to the systematic catalogue with which I propose to conclude this paper, and though aware that these trifles of fresh knowledge of the Class best fitted for natural dispersal, is a mere drop in the ocean of fact still required before any stable theory can be founded, I am loth to leave the subject of geographical distribution without a word or two, if only to pick up the few threads of speculation written by the illustrious Hooker nearly 50 years ago on the origin of the Moroccan Mountain-Flora*. Sir Joseph Hooker, reviewing the botanical results of his expedition in 1871 to the upper regions of the Great-Atlas, while remarking that "we only possess a fragment of its Flora, and future exploration may largely modify our conclusions ....." found that:—

(*a*) "nothing indicates any special connection between the Floras .... of the higher zones of the Great-Atlas, Algerian-Atlas, and Sierras of Andalusia."

(*b*) "the absence of distinct generic types is most marked."

(*c*) "in species .... the Mountain-flora of the Great-Atlas differs widely from that of the Andalusian Sierras, despite their comparatively small separation and the

* Hooker (Ball & Maw) "Journal of a tour in Marocco and the Great-Atlas." London, 1878.

exposure to not altogether dissimilar climatic conditions of their corresponding upper zones . . . . . Nearly half the plants found in the higher region of the Great Atlas are absent from the Andalusian Sierras, although a notable proportion are to be found in Central and Northern Spain."

(*d*) "Of special interest is the fact that many of the species thus absent from S. Spain are plants of Central Europe . . . . (the so-called "Germanic" Flora), most of which extend to the north part of the Spanish Peninsula, although some of them are altogether wanting in the Floras of Spain or Portugal."

Hooker concluded that (for reasons explained in the book) "it is at least possible that the wide diffusion of many species constituting the so-called "Germanic" Flora may date from a period much more remote than is ordinarily supposed" (Pleistocene).

In the light of this conclusion Plate XI. *c* illustrates a possible early source of influence on Distribution, through the handing over, as it were, of the Riff by Europe to Africa.

Let us now review the subject in the light of (present knowledge of) the distribution of Birds in Mauretania*.

Excluding purely marine forms, the list of Sedentary (or resident) birds of Mauretania is represented by † 93 genera and 122 species composed as follows :—

A. 86 species *also found in South Spain*, whose further range is entirely "Palæarctic" and as follows :—

49 are widespread to the north and north-east over the "European" and/or "Siberian" sub-regions.

11 spread easterly to the Far-East over the "Mediterranean" and "Manchurian" sub-regions.

* As represented by modern Tunisia, Algeria, and Marocco.

† All figures that follow must be taken as approximate only. Limitation of space forbids publication of the lists from which the figures have been compiled.

10 spread easterly to the Middle-East over the "Mediterranean" sub-region.

11 are found throughout the whole basin of the Mediterranean but not further east.

5 are found only in the western part of the Mediterranean basin.

Conversely, South Spain has only 7 species not found in Mauretania, viz.: *Cyanopica cyanus*, whose distribution is anomalous; the Long-tailed, Crested, and Marsh-Tits, whose centre of distribution is boreal; and the three mountain species, Snowfinch, Alpine Accentor, and Ring Ousel.

The other point of Europe nearest to (but ten times more distant, though perhaps of less ancient land connection with) Mauretania, viz., South Italy-Sicily, is less rich by ten of the above and has only one or two additional species, the Italian Sparrow and ?the Thick-billed Reed-Bunting (*E. pyrrhuloides*).

B. 36 species *not found in South Spain* whose range beyond Mauretania is as follows:—

20 spread easterly beyond Arabia.

9 spread east and south-easterly into N.N.E. Africa.

1 (*Francolinus bicalcaratus*) spreads to Tropical West Africa.

1 (the Shore-Lark) is widespread in Europe and Asia, save in the south-west and south-centre of the former Continent.

5 are confined to Mauretania.

Of the above (B), half are *desert* forms of Larks, Chats, Warblers, Finches, etc. of genera in about equal proportion Palæarctic and Ethiopian, and are presumably the specialized product of dominant forms in the borderland of the great stretch of desert from the Atlantic to North-west India, so that there remains only 18 species of as many genera, *i. e.*, 15 per cent. of the whole Mauretanian list, not distributed in simple extension within the Palæarctic Region.

Of these, the 5 species apparently confined to Mauretania are :—

Rhamphocorys clot-bey and *Chersophilus duponti*, two Desert Larks, the sole representatives of their genera.

Diplootocus moussieri, the only representative of its genus, which, however, is near those of the Palæarctic Redstarts and Chats.

Sylvia desertivola, a Warbler of the Mediterranean "*Melizophiline*" type.

Numida sabyi, one of the thoroughly "African" Guinea-fowls nearest to *N. meleagris*.

Of the remaining 13, all but two are reasonably accounted for by their wide ranging propensities or by transition from the eastward. The exceptions are *Otis arabs* and *Francolinus bicalcaratus*, which (even should they prove to differ racially from the African species), with the Guinea-fowl, are certainly the most exotic representatives of the Mauretanian Avifauna.

To sum up : even if we include the Tschagra, Bulbul, and Bush-babbler, it must be admitted that the genera and species of the Mauretanian Avifauna, with the so-formed 5 per cent. African infusion of species, are remarkably free from complex affinities when compared with those of many other bounding territories of the "Zoographical Regions"; and, as might perhaps be expected, exhibit nothing of the peculiarities of distribution attributed by Hooker to the plant-species of the Upper Great-Atlas.

The gap of south-west and south-central Europe between the Maroccan-Atlas and the rest of the vast area occupied by *Eremophila alpestris* is curious, but cannot be given more weight than that of an isolated exception.

Now let us review the subject in the light of *Racial* distribution.

Out of the 86 species common to Mauretania and South Spain, one half of the species are represented in Mauretania by different racial (or subspecific) forms, and if we eliminate

from the other half all the species that preserve a common form over a very wide area, or practically the whole of their known range, there remain but three or four subspecific forms, Greenfinch, Linnet, Imperial Eagle, and perhaps Woodlark, common to the two territories.

Or, taking another view: out of the 42 species common to, but represented by different races in Mauretania and South Spain, 24 (only) are of race peculiar to the latter, the remaining 18 are all of races that extend far and/or wide on the European Continent, the most remarkable perhaps being the Magpie, Chaffinch, Nuthatch, Missel-Thrush, and Red-legged Partridge.

Viewed in either of the foregoing aspects, one cannot help observing the singular influence of the eight mile wide Straits of Gibraltar as a *subspecific* boundary between Europe and Marocco.

It now remains to examine distribution within the bounds of Mauretania itself; but here, even in the Bird "Class" we are confronted by the following serious obstacles :—

(*a*) The Riff, except at its extreme northern end near Tetuan is quite unknown.

(*b*) The western Great-Atlas and north-east branch of the Middle-Atlas, containing the dominant massif of the range, as well as the Marocco-Algerian confines, are quite unknown.

(*c*) The Desert-slopes of the Great-Atlas are practically unknown.

(*d*) The mountains of Western Algeria and the Saharan-Atlas Range have so far only been "skimmed," and the same may be said of all the remainder of Marocco except the Atlantic seaboard, the western extremity of the Great-Atlas, and the neighbourhood of Tangier.

But even these serious limitations scarcely obscure two outstanding distributional facts in Mauretania.

Firstly :—In to-day's physical map of Europe there is much that suggests the individuality distinguishing certain islands and parts of the Continent ; but in this compact-looking strip of Mauretania, surrounded by sea and desert, with a mountain-tract all along its Mediterranean seaboard, there seems little indicative of subdivision. On the contrary, there must be something in Marocco in addition to its present surface features, which gives it a distinct individuality apart from the remainder of "Little Africa." For example : of Mauretania's 122 Resident (non-Marine) species, nearly 30 per cent. either do not range over the whole territory, or are disposed in two or more subspecies throughout it as follows :—

*17 species in Tunisia and Algeria are not in Marocco.
7 species in Marocco are not in Tunisia and Algeria.
10 species have subspecies in Marocco that differ from the corresponding subspecies in Tunis and Algeria (sometimes more than one in either case).
1 species only (the Chaffinch) has a different racial division, viz. Marocco and Algeria/Tunis.

This may, in part, be explained by the following :—

(*a*) The Algero-Tunisian boundary is only a political one ; it is not indicated physically like the Algero-Maroccan, by the abrupt termination of the Great- and Middle-Atlas ranges, in the Ouad M'louya valley and its adjoining tracts of desert and steppe.

(*b*) Marocco's separation from the Sahara is abruptly defined by the Great-Atlas, whereas Algeria and Tunis both "peter out" into the Sahara in a succession of arid steppes and plateaux—a fact that accounts for their large number of desert forms.

(*c*) Algeria and Tunis lack Marocco's Atlantic seaboard which largely influences the climate and the passage of migratory birds.

* This figure is likely to be reduced somewhat when the south slopes of the Great-Atlas are better known.

But I think that for the *full* explanation we must look to future exploration to provide the necessary material.

Secondly:—The racial distribution of species which presumably owe their origin and existence so far south to the high ground with its more northern climate is remarkable. To explain this phase I have attempted, in Plate XI. *a* & *b*, to show the present relations between altitude and forest-growth in Mauretania.

Plate XI. *a* is a map showing the mountain-tracts with special reference to those elevations which, given suitable climate and soil, favour real forest-growth. Plate XI. *b* shows (very roughly) the actual tracts of real forest-growth that now exist.

It is well known that among sedentary forest or woodland species, occurs much of that racial distribution for which no present reason seems to exist: witness, for instance, such near-home instances as the Irish Coal-tit and Jay; the Nuthatch's absence from the Isle of Wight and abundance in the New Forest; etc., etc. ... and being, *faute de mieux*, obliged to confine my remarks to the Class perhaps least well suited for the purpose, I have chosen the illustration afforded by the distribution of certain typical resident forest-birds in Mauretania.

If in the foregoing pages the reader has an impression of vast expanses of forest in Mauretania, this map should disillusion him: the term "well-forested" is always a comparative one. Even if, here, one may walk in a selected direction for days through forest-growth and tree-horizons, and though both history and recent observation suggest that in bygone centuries the Mauretanian forests were more extensive than now, the idea of comparing them in their past or present to the great subarctic and tropical forests of the world is absurd; indeed, it is highly improbable that Mauretania ever possessed forests comparable with those of Central Germany, Flanders, or even our own islands in early Roman days. Perhaps human agency, in this way, has

slightly influenced racial distribution in Mauretania; but for myself I think it cannot have been drastic enough to be of much account, and that we must here seek the real explanation of all such problems in natural causes.

NOTE: I consider the much-quoted case of the Bermudan (introduced) Goldfinch is apt to mislead, and see in it no more of a guide to the rate of Variation in Nature than you get from a few generations of "fed" Wild-ducks.

The following table gives the variety of racial forms of the six selected typical woodland-species that inhabit the forest-areas in question:

RACES (Subspecific name abbreviated).

Locality.	*Jay.*	*Creeper.*	*Nuthatch.*	*Coal-tit.*	*Green Woodpecker.*	*Gt. Spotted Woodpecker.*
S. Spain	klein.	ultra.	?cæsia	vieræ	sharpei	hisp.
Riff	whit.	?	?	?	vaill.	maur.
Woods of the Plain (Forest of Mamora).	0	0	0	0	0	maur.
Middle-Atlas	œnops	maur.	atlas	atlas	vaill.	maur.
Great-Atlas	œnops	maur.	?	atlas	vaill.	maur.
Mts. of Tlemcen.....	whit.	maur.	0	?	?vaill.	?
Algerian Tell	cerv.	maur.	0	ledou.	vaill.	numid.
Saharan Atlas (Djelfa forest).....	œnops	?maur.	0	?	?vaill.	?
Aurès Mts.	cerv.	maur.	0	ledou.	vaill	
Tunisian Mts.....	cerv.	maur.	0	ledou.	vaill.	numid.

Note:— 0=Species does not exist.
?= „ may exist.
?(name)= „ does exist and is *probably* (name).

A satisfactory explanation of these distributional problems is beyond my powers, and indeed will scarcely be possible until much more material in all departments of Zoology is available, but in Plate XI. I have endeavoured to suggest certain lines of thought for the consideration of those interested in the subject.

Now that, thanks to French progress, Marocco has at last become more or less accessible to field-workers, may we not hope soon to have her placed on at least an equal footing in Natural Science with Tunisia and Algeria?

If Mauretania is free, by reason of the vast desert at its southern edge, from the complexities of distribution that occur in the Himalayas and other borderland areas of the Palæarctic Region, its Moroccan portion, with the comparatively narrow Alpine Range perched on the very brink of the Sahara, suggests that certain phases of distribution may here be capable of study in their "limit."

Even should it not be so, I can confidently assure any of my readers who wish to make a contribution to our knowledge of the "Systema naturæ" that they are not likely to regret a trip to Marocco.

For the benefit of those who will take up the subject, a double line has been placed in the margin of the text where allusion to conspicuous deficiencies in our knowledge of the birds is made.

The length of the foregoing remarks has reduced the space available for the customary catalogue with which to conclude my paper, and I find it necessary to curtail and abbreviate it, for which I owe an apology to my brother members. But my more detailed field-notes are at the disposal of any one who cares to ask for them: the specimens themselves are in the Natural History Museum, except for a few representatives of the rarer subspecies, which are at Tring; a trifling return for all the kind help given me by the late President of the B. O. C. and Dr. Hartert.

Appendix I.

Notes on Ornithological Bibliography of Marocco.

A very complete Ornithological bibliography up to 1906 of the "Atlas territories" was published by Herman Schalow in

J. f. O. liv. pp. 100 *et seq.*

The articles and works treating of Maroccan Ornithology that have helped me most are :—

Hartert, E.—"Die Vögel der paläarktischen Fauna."

Vaucher.—"Liste des Oiseaux observés au Maroc de 1884 à 1914." Revue franç. d'Orn. 1915, pp. 94 etc.; "Additions to ditto." Revue franç. d'Orn. 1916, p. 225 *et seq.*

Ibis, 1885.—Reid, S. G. "Winter notes from Marocco."

Ibis, 1898.—Whitaker, S. "On a coll. of birds from Marocco."

Ibis, 1903.—Meade-Waldo. "Bird notes from Marocco and the Great-Atlas."

Ibis, 1905.—Meade-Waldo. "A trip to the Forest of Mamora."

Hartert, E.—"Frühlingsausflug nach Marokko und Tenerife." Nov. Zool. ix. 1902.

Hartert, E.—"Coll. of Birds at Rio del Oro, by Mr. Riggenbach." Nov. Zool. x. 1903.

Lozano.—"Contrib. al estudio de las Aves de Mogador." Madrid Mem. Soc. Esp. Hist. Nat. 1913.

Boudarel, B.—"Oiseaux recueillis dans le S.W. du Maroc....." Revue franç. d'Orn. 1913.

"Sarcelle" (Payton).—Numerous contrib. sport, &c. S.W. Maroc. Field, 1878–91.

Various notes.—Bull. B. O. C. 1897, 98; 1901, 02, 03, 05, 06 .... Ibis, 1867, 69, 74, 79, 85, 91, 92, 93, 97. ....

Part IV.

Catalogue of Birds obtained and observed *in the Middle-Atlas (only)*, with some Field-notes.

These notes are strictly confined to my own observations between 25 April and 17 July; winter observations are yet required before any species can be *proved* a Resident one.

The English name is that of the Species (since many racial

forms have never yet been given English names, and some care in giving and using English names is desirable).

The order and nomenclature is that of Dr. Hartert's "Die Vögel der paläarktischen Fauna."

In the list are included as [absent] the names of certain Mauretanian species, which were looked out for, as possible, or likely to occur in the Middle-Atlas, but never found there.

Abbreviations used.

R. = Resident.
S. = Summer visitor.
M. = Migrant (passage).
[ ] = probably; every reason to suppose, but not yet *proved*.
abd. = abundant.
com. = common.
mod. = moderately common.
occ. = occasional.
r. = rare.
v. = very.
b. = breeds, breeding.
N. = nest.
9 ft. = 9 feet *above ground* (nest site).
e. = eggs (6 e.=6 eggs).
y. = young in nest.
a. = addled egg.
d. = days. 6 d. = 6 days *old* for young; = 6 days *incubated* for eggs.
juv. ab. = young abroad (recently out of nest).
ad. = adult.
13.5 = (date) 13th May.
\+ = of one family, or bird *and its* nest.
Coll. = specimens collected.
l. For. = lower Forest, 4700 to 5100 ft.
m. For. = middle Forest, 5100 to 5600 ft.
u. For. = upper Forest, 5600 to 6000 ft. (top).
l. m. For. = lower *and* middle Forest.
Plat. = Plateau.
base = base of "N. Slope" below the Forest including "Mamelons."

Corvus corax tingitanus Irby. (Raven.)

Coll. ♀ ad. from N. 5 e. 6 d. 8.5. [R.] abd., b. everywhere, N. trees and crags. Parties of six or more all through summer, and swarms up to 80 after June. Great variety of notes, deep quack like a hoarse duck, mocking laugh "wok-wok-wok," reminding of *Paradisea apoda*, &c.

Daw [absent].

Garrulus glandarius œnops Whit. (Jay.)

Coll. 4 ♂ ad. 26.4. to 17.6.; 2 ♀ juv. ab. 15.6. [R.] com.; b. l. m. u. For. Earliest juvs. ab. mid-June. Only nest found had young flown, 24.6. Against ilex trunk 9 feet, like N. of British Jay.

Pica pica mauretanica Malh. (Magpie.)

Coll. ♂ ad. parent + juv. ab. 25.5. [R.] com. but v. local; N. brushwood outskirts of For. Sev. family parties just ab. near Ito 4750 ft. Ad. also seen 13.6. in "Barrens." Cobalt eye-patch of juv. same as ad.

Pyrrhocorax pyrrhocorax (L.). (Red-billed Chough.)

Coll. juv. ab. 29.6. full grown. [R.] com., b. crags above 4000 ft., and in Crater on Plat. N. y. 7 d. and N. y. 14 d. 29.6.

Oriole [absent].

Sturnus unicolor Temm. (Spotless Starling.)

Coll. ♂ ad. 24.5. [R.] com. local; b. all altitudes except l. m. For. N. y. flown 17.5.; y. heard in N. cedars 20.6.

Coccothraustes coccothraustes buvryi Cab. (Hawfinch.)

Coll. 4 ♂ ad. 18.6. to 11.7.; 2 ♀ ad. 3.7.; 3 juv. ab. 5.7., 11.7.; 2 y. 5 d. 26.6. [R.] abd.; b. l. m. For. N. 2 y. 5 d. 26.6.; hor. bough top ilex 40 feet. Nest massive because framed with lichen, like a nest of Missel-Thrush; for same reason v. difficult to detect. Fam. parties, swarming at wild cherries all July; parents plucking fruit and feeding young; whole berries.

Greenfinch [absent].

Acanthis carduelis africanus. (Goldfinch.)

Coll. ♂ ad. + ♀ ad. (pair) 3.6. [R.] abd. up to 6000 ft.; e. up to July.

Acanthis cannabina mediterranea (Tschusi). (Linnet.)

Coll. ♂ ad. 17.5.; ♂ ad., ♀ ad. 18.5. ? R. com. up to 4700 ft.; b. base. b. early; juv. ab. before 25.4. Sev. this year's hatched-out nests; scrub juniper, 3.5. Ad. and juv. frequented spot independently, but no second nests made.

Crossbill [absent]; no pines.

Fringilla cœlebs africana Levaill. (Chaffinch.)

Coll. 2 ♂ ad. 2.5., 4.7.; ♀ ad. 14.5.; ♂ juv. 2.7.; ♀ juv. 4.7. [R.] abd.; b. l. m. u. For. b. late; curious, flocks up to 40,

mixed sexes, up to mid-May. Earliest eggs 2nd week May. Earliest juvs. ab. not till end June. Song of ♂ same style as British, trifle less musical; but call-note "spink-spink" especially in ♀, no timbre, more like double-*chirp* of a Sparrow.
|| Is "*kœnigi*" distinct form?

Serinus serinus serinus L. (Serin.)
Coll. 2 ♂ ad. 15.5., 20.5. [R.] mod.; b. u. For.

Petronia petronia (? **barbara** Erl.). (Rock-Sparrow.)
Coll. ♂ ad. 13.6. v. worn, had bred. ? R. mod., Plat. edge "Barrens" among cedars. Only spec. obt. is much suffused below with pale snuff-colour, esp. throat either side yellow spot, and leg-feathers right up to root. But suspect volcanic-dust discoloration.
|| Fresh plumage examples *wanted*.
Small (prob. fam.) parties, June–July. Sev. also seen above Ain Leuh 27.4.

Passer domestica (? race). (House-Sparrow.)
[R.] com., b. up to Azrou. No Coll.; looked like *domestica*.

Emberiza calandra calandra L. (Corn-Bunting.)
Absent from Middle-Atlas. (? R. com. Tigrigra Valley, where N. 6 e. 4 d. 29.5, and abd. lower alts.)

Emberiza cirlus L. (Cirl Bunting.)
Coll. ♂ ad. + ♀ ad. + N. 5 e. 2 d. 13.5. N. 4 y. 15 d. 26.6. [R.] r. base and l. For.

Emberiza cia cia L. (Rock-Bunting.)
[R.] r. base. Twice seen, close range; not obtd.

Calandra Lark [absent].

Short-toed Lark [absent].

Galerida cristata riggenbachi Hart. (Crested Lark.)
Coll. 2 ♂ ad. 11.5., 28.5.; ♀ ad. laying e. 28.5. [R.] com. base and lower alts.; looked same Race all way up from Casablanca. Absent from Plat.

Thecklæ Crested Lark [absent].

Lullula arborea (? **harterti** Hilgert). (Wood-Lark.)
Coll. 4 ♂ ad. 27.4., 15.5.; ♀ ad. 20.5.; 2 juv. ab. 4.6., 13.6.; N. 2 y. 14 d. + 1 e. a. 5.5. [R.] abd. 4600 ft. to "Barrens"; not on Plat. or *in* For. N. 5 e. 8 d. 4.6.

Fresh plū. specns. wanted to determine race; general colour depends much on feather-borders; the dark centres are similar in all races.

Song characteristic, ubiquitous; not entirely ceased by July.

Alauda arvensis (? race). (Skylark.)

Coll. 5 ♂ ad. 23.5. to 29.6.; ♀ ad. 12.6. (laying e.); 3 juv. ab. 14.6., 28.6. ? R. abd. Plat. N. 4 e. 4 d. 24.5.; N. 4 e. 5 d. 13.6.

A Skylark with attenuate bill and fine crop-flecks like *harterti*, but much blacker above, and with darker ear-coverts. Whole plumage suffused delicate pink-buff tinge, specially noticeable on the light underside. This is not due to stain and seems peculiar. Believe will prove same as breeding race of S. Spain and Portugal sierras (judging from two v. poor but only specns. available here), but does not at all agree with *description* in Orn. Monatsb. 1913 of *A. a. sierræ* Weigold, which breeds in Sa. Nevada, 6000–9000 ft. Song and habits as British Skylark. Nest and eggs ditto. Av. 8 e. 22·1 mm. × 16·4 mm.

Wanted, fresh plumaged specns. that breed Atlas and Iberian Sierras.

Eremophila alpestris (? **atlas** Whit.). (Shore-Lark.)

Coll. 8 ♂ ad., 4 ♀ ad. 23.5. to 10.7.; ♂ ad. + ♀ ad. + N., 2 e. 2 d. 9.6.; 1 juv. ab. 12.6. ? R. com. Plat.

Almost certainly *atlas* (a specn. sent to Sicily to compare with type).

N. of 9.6. prob. second laying. My first acq. with Plateau, 23.5; shot ♀ carrying "stonefly," obv. to young. From bare breast, think ♂ shares incub. N. on a small earthy flat; few stones; had held water too late in year to grow herbage. A detached root of dwarf cistus had here become partially embedded in the floor; under it the *birds* had apparently made an earth-mound, with a crater in it to contain the fairly substantial nest (of dry wiry pieces grass, rootlets and vegetable down, with shallow cup) in it, and added a front doorstep of some 50 pebbles, like a Blackchat. Whole site, root-canopy, and all, v. like that of an *Alæmon alaudipes* found P. Sudan, 1914. Birds always near, or on similar bare flats, often v. stony. Never heard one utter a sound of any sort or make any courting display. Young ab. always hid in long grass after first rise with parents; 3 apparently max. brood, perhaps only 2.

2 e. of 9.6.=full clutch, *vide* ♀ ovary. See Plate X. *a* of N. photo taken on 31.5. when building; note absence of pebbles, added later. e. typical of *E. alpestris*; long blunt ovals, 25 mm. × 16·7 mm. and 25 mm. × 16 mm.

Anthus campestris campestris (L.). (Tawny Pipit.)

Coll. ♂ ad. 17.5.; ♀ ad.+N. 5 e. 4 d. 26.6.; y. 12 d. 22.5. S. mod. base to Plat. The y. of 22.5. brought me by native near Timoudit; curiously earlier than any breeding at base near Azrou. Alarm-note like small pipe of Golden Plover—brutes! . . . (but only to the nest-hunter). At base arrived about 4.5.

Motacilla boarula boarula L. (Grey Wagtail.)

Coll. ♀ ad. 29.6. ? R. r. base. Single specn. obtd. at base of Azrou Gully. Breeding over. Sure to have bred not far off. ♀ ad. seen Ain-Leuh cascade, 28.4.; prob. breeding there.

Certhia brachydactyla mauretanica With. (Creeper.)

Coll. 2 ♂ ad., 2 ♀ ad., 25.4. to 19.16.; ♂ ad.+N. 3 y. 10 d. +1 e. a. 8.7.; ♀ ad.+N. 5 e. 3 d. 11.6. [R.] abd. l. m. u. For. Late breeder; no juvs. ab. before July. N. never found behind semi-detached bark, but in holes rotten ilex boughs; vertical entrance in both the above nests.

Wall Creeper [absent].

Sitta europæa atlas Lynes, Bull. B. O. C. Nov. 1919. (Atlas Nuthatch.)

Coll. Types, ♂ ad. 3.5.; ♀ ad. 19.5.; juv. 7.7.; and 2 ♂ ad. 2 ♀ ad. 25.4. to 27.6.; ♂ ad.+ ♀ ad.+N. 7 e. 3 d. 7.5.; 3 juv. ab. 3.7., 7.7. N. 6 e. 6 d. 19.5. (Plate IX. *a*); N. 6 y. 2 d. 19.5. [R.] abd. l. m. u. For. New subsp. v. similar to *cæsia* but bill conspic. more slender, attenuate, smaller base, and feet and claws rather weaker. Wing of 4 ♂ ad. average 87 mm., rather longer than *cæsia*.

Colour below inclined to paleness, but *wanted* fresh plu. specns. to see if constantly more so than other races.

Not minor, which has short thick bill. N. in hole ilex 4′ to 20′, moss, then dry leaves of ilex and hawthorn; lined few ilex bark-flakes; entrance mud-cemented like British Nuthatch. e. like British Nuthatch; 13 e. av. 20·3 mm. × 14·8 mm. ♀ 25.4. laying eggs; prob. earliest. Very noisy: loud, continuous "chēēp-chēēp . . ." and "chich-e-wēē—chich-e-wēē . . .," but no trilling like British Nuthatch.

Parus major excelsus Buvry. (Great-Tit.)

Coll. 2 ♂ ad. 20.4., 26.4.; ♂ ad.+ ♀ ad.+N. 10 e. 0 d. 19.5.; juv. ♂ 14.7. [R.] abd. l. m. For.; mod. u. For. Habits, N. e., much like British Great-Tit. Looks as if specns. from Middle- and Great-Atlas run larger than Marocco Plain birds, but quite same colour. Similarly with Florentine Mt. *P. major*. Amount of white on outer tail-fea. v. variable.

Parus cæruleus ultramarinus Bp. (Blue-Tit.)

Coll. ♀ ad. + N. 7 e. 4 d. 26.5.; 2 juv. ab. 2.7. [R.] abd. l. m. For.; mod. u. For. Habits, N. e., much like British Blue-Tit. Many N. found. (Also N. 10 e. 2 d. + ♀ ad. 20.4. For. of Mamora.)

Parus ater atlas Meade-Waldo. (Coal-Tit.)

Coll. 6 ♂ ad. 25.4. to 27.6.; ♀ ad. 20.6.; 1 juv. ab. 3.7.; ♀ ad. laying e. 2.5.; ♂ ad. + ♀ ad. + N. 3 e. 6 d. 15.6.; ♂ ad. + 6 y. 15 d. 15.6. [R.] abd. m. u. For.; mod. l. For. Earliest e. prob. last week May. Loud distinctive "call-song"—"tsi-chēēp—tsi-chēēp—tsi-chēēp....." and "its-so-chēēp—its-so-chēēp.. ...". The five specns. of 20.6. from large flock 40 or more adults, worn plu., sex organs quite small; apparently non-breeders? 4 N. found, all *in* the ground, entrance-hole at the side of a stone or fallen log; other N. not found earlier in season because I had thought the bird dropped the nesting material in its beak, on the ground, on account of being watched. N. solid base of fine dry rootlets, lined much fur of ape, sheep, etc. Eggs like British Coal-Tit, but size larger and ground white tinged faint yellow-pink. 1 e. = 17·8 mm. × 13 mm.

Regulus ignicapillus ignicapillus (Temm.). (Firecrest.)

Coll. ad. ♂ 3.5.; ad. ♀ 8.7. (with brood ab.). [R.] com. l. m. u. For. Rather late breeder, first juvs. ab. not until about 21.6. 1 N. ilex 15 ft., 1 N. cedar sapling, 10 ft.

Lanius senator (? race). (Woodchat.)

S. r. Barrens—*not* For. Only twice seen; likely looking place for N. (but com. in brushwood near Ito).

Muscicapa striata striata (Pall.). (Spotted Flycatcher.)

Coll. ♂ ad. 6.5.; ♀ ad. 9.7.; ♂ ad. + N. 3 e. 2 d. 28.6.; N. 3 e. 3d. 19.6. S. abd. l. m. u. For. Arrived first week May.

Muscicapa atricapilla speculigera Bp. (Pied Flycatcher.)

Coll. ♂ ad. 7.5.; ♂ ad. + N. 5 e. 0 d. 27.5; ♂ ad. + N. 5 e. 10 d. 8.6.; ♀ ad. + N. 4 e. infertile, 21.6. S. abd. l. m. For.,

mod. u. For. Arrived before Spotted Flyc. First N. 5 e. 0 d. 27.5. Second N. 6 e. 8 d. 4.6., etc. N. in holes, ilex, 10–30 ft. Dry grass, finer lining ditto, no hairs or feathers, slight, e. like *atricapilla* [6 = max. clutch]. Noisy, notes loud and varied, one reminding of Bee-eater; another, plaintive "pipe-song" something like rich Robin song, seemed quite diff. to British Pied Flyc. Racial characters very clear.

Phylloscopus bonellii bonellii (Vieill.). (Bonelli's Warbler.)

Coll. 3 ♂ ad. 3.5. to 16.5.; ♀ ad. + N. 5 e. 2 d. 1.6,; N. 5 e. 1 d. 27.5. S. abd. l. m. For.; mod. u. For. Juv. ab. not till near July. Can watch ♀ on to nest like Wood-Wren, note and all (call-note mixture of Wood- and Willow-Wren).

Wood-Wren [absent S.]; but one, prob. *sibilatrix*, M. seen 25.4. l. For.

Phylloscopus trochilus trochilus (L.). (Willow-Wren.)

Coll. ♀ ad. 6.5.; l. For. M. r. In beautiful fresh plu.

Hippolais polyglotta. (Melodious Warbler.)

Coll. ♂ ad. 16.5.; ♂ ad. + juv. ab. 24.6.; N. 4 e. 3 d. 7.6.; N. 3 e. 3 d. 23.6. and others. S. abd. base to Plat. edge where bushes. Arrived about 3.5.

Orphean Warbler [absent].

Sylvia atricapilla atricapilla (L.). (Blackcap.)

Coll. 2 ♂ ad. 10.6.; ad. ♀ + juv. ab. 8.7.; N. 3 e. 0 d. 8.6. S. mod. l. m. For. Arrived first week May. Like many southern individuals, these incline to dark tint, *vide* Hart. Vög. Pal.

Sylvia communis communis Lath. (Whitethroat.)

Coll. ♂ ad. 15.5.; ♀ ad.+N. 5 e. 2 d. 29.5.; juv. ab. 5.7. S. com. all alts. up to Barrens. Other N. found. Arrived first week May.

Sylvia conspicillata. (Spectacled Warbler.)

All through May watched a ♂ at juniper scrub on side of an Azrou mamelon, singing and doing best to breed without a mate! Come June he gave it up and disappeared. Only one seen.

Sylvia cantillans inornata Temm. (Subalpine Warbler.)

Coll. ♂ ad., ♀ ad. 10.5.; ♀ ad. 25.6.; ♂ ad. + juv. ab. 18.6.; N. 4 e. 2 d. 7.6.; N. 4 e. 7 d. 23.6. S. mod. base. Arrived about 1.5. Eggs handsome red blotch and spot type. The white moustache of ♂ almost absent is a noticeable field character.

SYLVIA MELANOCEPHALA
„ SARDA
„ DESERTICOLA
} all [absent].

Turdus viscivorus deichleri Erl. (Missel-Thrush.)

Coll. ♀ ad. 27.4., would have laid first of 4 or 5 e. on 28.4; 2 juv. ab. 29.5.; 2 juv. ab. 1.6.; fam. parties; ♂ ad. 1.7. N. 4 y. 17 d. 4.7. [R.] Com. l. m. u. For. Never saw one that in the field did not look much paler and *greyer* than British Missel-Thrush. In the juvs. ab., the topside, esp. rump, is much more grey-green olivaceous than are even the least "brown" Europeans examined. More silent than Brit. bird both in song and alarm. First juvs. ab. about 15.5.

Turdus merula mauretanica Hart. (Blackbird.)

Coll. 3 ♂ ad. 8.5. to 8.6.; 3 ♀ ad. 3.6. to 14.7.; 7 juv. ab. 3.7. to 12.7.; N. 3 e. 3 d. 20.5.; N. 1 e. 0 d. 5.6.; N. 2 y. 7 d. + 1 e. a. 5.7.; N. 2 y. 15 d. 11.7. [R.] com. l. m. u. For. Rather late breeder, laying not till second week in May. Song very loud and sweet. Juv. plu. in two phases, "grey" and "brown" in each sex.

Monticola solitarius solitarius (L.). (Blue Rock-Thrush.)

Coll. ♂ ad. 19.5. ? R. Com. locally, *not* For. com. Timoudit, but r. Azrou.

Saxicola œnanthe seebohmi Dixon. (Seebohm's Wheatear.)

Coll. 3 ♂ ad. 24.5., 30.5.; 4 ♀ ad. 22.5. to 14.6.; 4 juv. ab. 29.6.; ♀ ad. + N. 5 e. 7 d. 14. 6.; N. 4 y. 12 d. 30.5. (Plate IX. *b*); juv. N. 19.6. N. 6 e. 0 d. 25.6. ? S. abd. Plat. All 3 nests under large, base-embedded stones, entrance track through herbage noticeable. N. *œnanthe* like, chiefly rootlets, a little dry grass and wool, and few feathers woven in, substantial. e. uniform medium blue or with 6–15 tiny rusty spots. Clutch 5 e. av. 20·8 mm. × 15·6 mm.; 1 e. spotted. Clutch 6 e. av. 21·0 mm. × 16·7 mm.; 2 e. spotted. Habits and song much same *œnanthe*. One ♀ ad. *laying* e. 30.5. partial assumption of ♂ ad. plumage, even blackish-brown throat. Unusually fat; ? possible connection between fat, vigour, and ♂-like plu. Tring has a ♂ ad. inclining to ♀ ad. plu. More specns. and study wanted here.

Saxicola hispanica hispanica (L.).

Coll. (*Black-throated Wheatear*) ♂ ad.+ ♀ ad.+N. 5 e. 0d. 18.5. S. r. base (but com. Tigrigra valley). (*Black-eared Wheatear*), only one ♂ ad. seen base during last week May; then ? finding no mate, disappeared.

Saxicola leucura syenitica Heugl. (Blackchat.)

Coll. ♂ ad. (with juv. ab.) 2.6., ♀ ad. + N. 4 e. 1 d. 31.5.; 2 juv. ab. 10.6. [R.] mod. base. N. 5 y. 4 d. 10.5.; N. 4 y. 4 d. + 1 e. a. 14.5. Racial characters quite clear, esp. broad tail-band.

All other species of Wheatear [absent].
Stonechat [absent].

Phœnicurus phœnicurus algeriensis Kleinsch. (Redstart.)

Coll. ♀ ad. 10.6.; ♂ ad. + N. 6 e. 7 d. 10.6. S. abd. l. m. u. For. First N. 6 e. 0 d. 24.5. Racial character of wing quite clear.

Diplootocus moussieri (Olphe-Gaillard). (Moussier's Redstart.)

Coll. ♂ ad.+ ♀ ad. + N. 4 e. 7 d. 13.5. [R.] com. base and Barrens. N. in cleft boulders; e. immaculate white, av. 18·9 mm. × 14·6 mm. N. & e. like Blackstart's.

Luscinia megarhynchos megarhynchos Brehm. (Nightingale.)

Coll. juv. ab. 3.7.; juv. ab. 11.7. S. local, l. For. Arr. early May. Sev. breeding nowhere near water.

Erithacus rubecula atlas Lynes, Bull. B. O. C. Nov. 1919. (Atlas Robin.)

Coll. 4 ♂ ad. 25.4. to 12.7.; ♀ ad. 10.7.; 2 juv. ab. 29.6., 8·7. [R.] com. l. m. u. For. N. 5 e. 2 d. 9.5.; N. 4 e. 4 d. 9.5.; N. 3 e. 6 d. 1.7. Near *rubecula*, especially some southern examples but differs from all, in topside, *including rump*, being dark earthy olive-green, lacking all rufous tinge. One of the big-billed forms. Looks inclined to nearly lack light wing-band altogether, but fresh plu. specns. wanted to determine. Habits, N., e. much same British Robin.

Troglodytes troglodytes kabylorum Hart. (Wren.)

Coll. 2 ad., ♂ 27.4., 20.5.; juv. ab. 25.6.; ♂ ad.+ ♀ ad.+N. 4 e. 6 d. 1.6. Earliest N. 4 e. 3 d. 2.5.; last N. 5 e. 1 d. 10.6. R.

com. l. m. For. N. e. habits much like British Wren. Many "cock's" nests. In *kabylorum* examples from high alts. appear to be rather more "barred" below.

Dipper [absent].

Chelidon rustica rustica (L.). (Swallow.)

? S. com. b. Azrou. Some N. inside native *living* rooms, as in China. First e. Azrou about 10.5.

House-Martin, Sand-Martin, Crag-Martin [absent].

Apus melba. (Alpine Swift.)

? S. com. local Plat. Apparently breeding Timoudit and in a "Crater." Swarms at Meknez, breeding in holes of city walls, 1.5.

Apus apus apus (L.). (Swift.)

Coll. ♂ ad. 24.5. Believe only autumn visitor to Middle-Atlas, after breeding in plains. First lots seen u. For. 19.5. flying round cedar tops. By 10.7. Swifts swarmed over Plat.

Apus murinus and Apus affinis [absent].

Caprimulgus europæus meridionalis Hart. (Nightjar.)

Coll. ♀ ad. 9.5.; ♂ ad. prob. of N. 2 e. 2 d. 22.6.; ♀ ad. + 1 e. 1 d. 26.6. S. mod. base, b. just below For. *only*. N. 2 e. av. 29·7 mm. × 21·5 mm.; abnormal, white; no undershell markings; few dark surface blotches. N. 1 e. 28·3 mm. × 20·3 mm.; normal but light ground col. Arrived about 9.5.

Red-necked Nightjar [absent].

Bee-eater [absent].

Upupa epops. (Hoopoe.)

[S.] mod. Barrens. Evid. N. in cedars. No juvs. ab. up to 21.6.

Coracias garrulus garrulus L. (Roller.)

[S.] mod. l. m. u. For. clearings. N. holes trees; y. still in N. being fed 9.7. (Swarms breed in city walls Meknez.)

Kingfisher [absent].

Picus vaillanti (Malh.). (Le Vaillant's Green Woodpecker.)

Coll. 2 ad. ♀ 27.4., 22.6.; ♂ ad. 8.6.; juv. N. 11.6.; juv. ab. 19.6. [R.] abd. l. m. u. For. Many y. hatched by 1.6.

Dryobates major mauretanus (Brehm). (Great Spotted Woodpecker.)

Coll. 2 ♂ ad. 27.4., 27.5.; 2 ♀ ad. 10.5., 6.6. [R.] abd. l. m. u. For.; b. rather later than Green W.; e. not till mid-May.

Lesser Spotted Woodpecker [absent].

Wryneck [absent].

Cuculus canorus. (Cuckow.)

M. r. 9.5. one ♂ called throughout day; species never seen or heard again.

Eagle Owl [no trace].

Otus scops scops. (Scops Owl.)

Coll. ♂ ad. 4.7., m. For. Only occasion seen. Sex organs breeding over.

Athene noctua glaux (Sav.). (Little Owl.)

Coll. ad. ♂ 23.6.; ad. ♂ +ad. ♀ 3.7.; ad. ♂ of 3.7., freak, pale var. S. com. base.

Strix ? sp. (Wood Owl.)

Twice seen in For., not obtained.

Falco peregrinus. (Peregrine Falcon.)

Apparently breeding in cliffs at base, 14.5.

Falco subbuteo jugurtha Hart. & Neum. (Hobby.)

Coll. 2 ♂ ad. 11.6., 12.6.; ♀ ad. laying e., 25.6 (1 soft in uterus, 2 more to come in ovary). ? S. mod. u. l. edges For.

Falco tinnunculus. (Kestrel.)

? R. com. above and below F. Certainly b., but no specimens obtained.

Falco naumanni. (Lesser Kestrel.)

Absent from Middle-Atlas, though swarming in cities of Plains and El Hajeb.

Aquila chrysaëtos occidentalis. (Golden Eagle.)

Coll. ♀ juv. 2.7.; circa 70 days age. Fully fledged sitting alongside nest at top of large cedar m. For. (Plate IV. *b*). N. under obs. since 3.5. when held 2 y. in down. The only Golden Eagles in the district.

(No other *Aquila* sp. seen.)

Buteo ferox cirtensis. (Rufous Buzzard.)

Coll. ♀ ad. + N. 1 e. 3 d. 14.5, full clutch fide ovary; ♀ ad. 29.5., light plu. young bird moulting into full ad. plu., ovary quite small. ? Freak since size only = small ♂ (Hartert). ? S. mod. l. m. For.—r. u. For. N. ilex bough, 15 feet.

? Belong to this sp., certain buzzard-flighted birds occ. seen on wing looking like small square-tailed Neophron—so black and white *below*—but mottled topside.

Accipiter nisus punicus Erl. (Sparrow Hawk.)

Coll. ♂ ad. 20.5.; testes small. ? R. mod. l. m. For. Freq. seen, but never found N. or y.

Melierax canorus (Chanting Goshawk) [absent].

Milvus milvus. (Red Kite.)

? R. mod.; l. m. u. For., also seen Plat. N. 2 y., sitting outside, 20. 6.

Milvus migrans migrans (Bodd.). (Black Kite.)

? S. ab. everywhere. N. 2 e. 5 d. 15.5.; ♀ sitting on. e. 3.5.; juv. ab. 10.6. A large proportion of the Black Kites seen were certainly not breeding.

Elanus cæruleus. (Black-winged Kite.) ? absent.

Thought to be seen once.

Circaëtus gallicus. (Snake-Eagle.)

? R. occ.; seen everywhere except Plat.

Gypaëtus barbatus. (Lammergeier.)

Constantly seen over u. F.; occ. at base after food. Prob. b. in For. crest crags to westward; locality inaccessible owing to hostile Berbers.

Neophron percnopterus. (Egyptian Vulture.)

? S. com. b. cliffs all alts. N. 2 e. 2 d. 8.5.

Gyps fulvus fulvus. (Griffon Vulture.)

Not b. Middle-Atlas but b. cliffs foot-hills, near Ito, where mod. com. summer. Saw skin shot Azrou winter.

Aegypius monachus. (Black Vulture.)

Nearly sure saw one fly over u. For. early in May.

Ciconia ciconia. (Stork.)

S. com. base (no higher). Swarms b. cities of Plain and collect Valley Tigrigra July.

Comatibis eremita. (Bald Ibis.)
Coll. ad. (head only) 24.5. ? R. com. base and Plat.; b. cliffs.

(All Heron Tribe absent.)

Casarca ferruginea (Pall.). (Sheld-duck.)
2 ad. shot 29.6, lake on Plat. where com. Eaten (no! uneatable). Sex organs not examined. May have been breeding in hills near by, but all ad. and in twos!

Colymbus ruficollis. (Dabchick.)
|| Sev. lake on Plat. 29.6. ? b.

Columba œnas L. (Stock Dove.)
Coll. 2 ♀ ad. 22.5.; by ovaries only *going to* breed! N. 2 e. 5 d. 8.7., u. For. [R.] abd. everywhere; fed in flocks in valley about 6 A.M. and 3 P.M.

Columba palumbus palumbus L. (Wood-Pigeon.)
Coll. ♂ ad. 25.4. N. 2 e. 7 d. 29.5. [R.] abd. l. m. u. For.; fed in flocks in valley about 6 A.M. and 3 P.M.

|| **Columba livia** (? race). (Rock-Pigeon.)
[R.] only seen in a cave near Azrou; few pairs; had bred; egg-shells floor of cave, 14.7.

Streptopelia turtur turtur. (Turtle Dove.)
Coll. ♀ ad. 24.6.; 2nd e. in oviduct. S. abd. base and l. For. N. 2 e. 4 d. 29.5. Arrived early May.

Burhinus œdicnemus. (Stone-Curlew.)
Not b. Middle-Atlas (a pair, ♀ laying e. [fide ovary], shot 23.5. in Tigrigra Valley, but r. there).

Otis tetrax. (Lesser Bustard.)
Not b. Middle-Atlas, but b. plains, then come up to Plat. to moult; small flocks first appeared Plat. 2nd week June. Sev. shot.

Fulica atra atra L. (Coot.)
|| 1 ad, shot 29.6, lake on Plat. ? b. there.

Coturnix coturnix coturnix. (Quail.)
Coll. ♂ ad. 24.5. S. com. b. Plateau (and Valley of Tigrigra).

Alectoris a. petrosa. (Barbary Partridge.)
R. abd. base. N. 13 e. deserted about 14 d. 17.5. Broods of cheepers just able to fly a little, first came in evidence last week June.

A

Azrou (4150 ft.) general view looking South towards the Middle-Atlas, whose crests (3) bound the horizon. Military Camp (2), "Woods and Forests Department" Camp (1).

B

At the foot of one of the "Mamelons" at the Northern base of the Middle-Atlas (4150 ft.)
Peace Day celebrations at Azrou.

A

In the lower (Ilex) Forest on the North Slope of the Middle-Atlas (4750 ft.)
Nest of Raven (Corius c. tingitanus) at Ilex top.
Five young, half-grown, Mid May.

B

On the "North Slope" of the Middle-Atlas looking down a gorge into the Valley of the Oued Ingrgra
Nest of Golden Eagle (Aquila c. occidentalis) at the summit of Cedar (5250 ft.)

A

Ascent to the "Home col" above Azrou, view at 5500 ft. An open gully, rocky and stony with dolomitic limestone (of dazzling brilliancy) in contrast with the surrounding forest.

B

In the Upper forest of the Middle-Atlas (5700 ft.)

A

A general view of the Upper forest, principally Cedars. Taken at about 5600 ft.

B

General view of the Forest on the North slope of the Middle-Atlas looking (North) down into the Tigrigra Valley (1) and across it the Plateau of El Hajeb (2) which here forms the Southern horizon.
Taken from Crest of North Slope at 5700 ft.

& SEABORNE, LTD., LONDON.

A

The "Barrens," i.e. one of the two types of border-zone between the Forest and the "Plateau." Middle-Atlas (5700 ft.)

B

The "Crest-mounds," i.e. the other type of border zone, between the Forest and the "Plateau." Middle-Atlas (5700 ft.)

A

On the "Plateau" of the Middle-Atlas (6200 ft.), showing new Road (in construction) and two cedar-crowned "Volcanic kopjes" at the Northern part of the Plateau.

B

On the "Plateau" of the Middle-Atlas (6200 ft.).
The "Route" across the Plateau at Jebel Hebbri Camp, looking South.

A

Nesting site of Atlas Nuthatch (Sitta c. atlas).
Six fresh eggs, May 19.
Upper forest at Middle-Atlas (5600 ft) (entrance hole under the fungus).

B

Entrance to nest of Seebohm's wheatear (Saxicola œ seebohmi), four young, three-quarters grown, May 30.
Plateau of Middle-Atlas (6200 ft.)

Nest of Atlas Shore-Lark (Eremophila a. atlas), two eggs, June 9. Plateau of Middle-Atlas (6200 ft.)

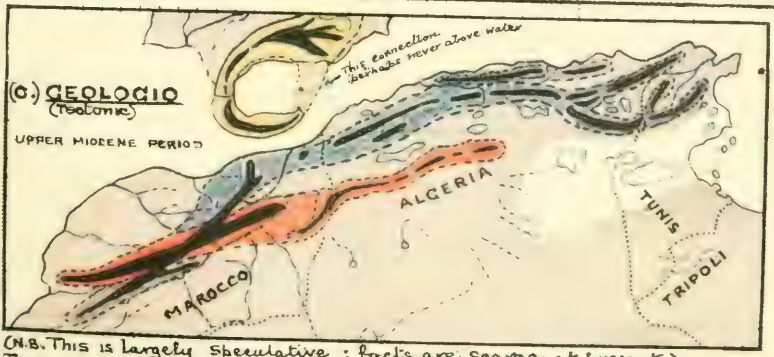
Forest of Mamora near Kinitra. (Note its open-gladed nature, of quite different character to that of the Middle-Atlas forest. The trees too, are mainly Cork and Oak, not Ilex).

MAURETANIA

SOME CONSIDERATIONS AFFECTING THE DISTRIBUTION OF CERTAIN OF ITS PRESENT FORMS OF LIFE

Shewing Altitudes :- 4500 to 6000 feet* coloured
above 6000 feet "
*In Mauretania the "Big-Forest" lies between these altitudes

Shewing in Colour the areas of "FOREST" in the sense of woodland or forest holding such typical forest-birds as Green and Great-spotted Woodpeckers Jay, Nuthatch Coal-tit, Creeper.
in GREEN = forest holding all, or not less than 70% of the above forms
in ORANGE = " " only 30% or less " " " "



(N.B. This is largely speculative : facts are scarce at present.)
The main tertiary formations are shewn in Colour cores
" land-areas " " tinted
" sea-areas " " uncoloured.

VITTY & SEABORNE, LTD.,

MAROCCO

WITH SPECIAL REFERENCE TO THE AUTHOR'S VISIT TO THE

MIDDLE-ATLAS RANGE

ZOOLOGICAL

The Zoology of the various parts of the country in question, is indicated in a very general way, and is mainly Ornithological. Omissions here must be regarded as mainly due to lack of space, and in branches other than Ornith: to the author's lack of knowledge rather than necessarily to absence of certain species.

Forest of Mamora at the its Northern edge, is not much varied in bird-life - and seems to lack entirely many species of the Middle-Atlas forest. Abundant - Raven, Cinereous, Black-bills, Chaffinch, Blue tit, Great-tit, ... Oceur - Oriole - Great-spotted woodpecker. Probably not until further South in the Forest occur Neotis, Numida - Francolinus, Wild Boar plentiful.

Regarded by residents as the best great bustard country, in easy reach of Rabat..... certainly Otis tarda there. Calandras and crested larks, corn-buntings ..... common.

Grey-shrike and either Telephonus or Argya seen but distinct not worked. Probably the African Passerine Genera are to be found in this Zone. Argya & Telephonus

Very poor in bird-life. Certain lark-roam hunting abundant, stonechat & bee-eater common, little else.

Crested larks and corn-buntings abundant. Bee-eaters & Stonechats common. On the palmetto scrub lizards, lesser bustards plentiful.

Crested larks, corn-buntings, Calandras. Little variety of bird-life as might be expected from the bleak inhospitable aspect of this Plateau. Moorish pie is to be found in the brushwood at the South edge of the Plateau - a very local species.

Some new birds appear here, mostly owing to the change in the Avifauna.

Typical Resident Forest-birds such as Jay, Great Spotted and Green Woodpeckers Creeper, Coal-tit, Nuthatch, etc quite abundant..... All belonging to one of the Mauretanic Races. Pied and Spotted Flycatcher, Redstart re abundant. From level of the Terrasse" (4700ft) upwards, the Woodlark entirely replaces the Crested-Lark. Golden Eagle. Lammergeier. Chough are here. Absent are Oriole, Greenfinch, Bullfinch and numbers of other characteristic lowland (Maroccan) species. Barbary Ape (Macacus sylvana), Wild-Boar abundant. Fox (V. atlanticus), Hare (?sp)..... frequent, etc.....

On the open Plateaux, Skylark (and Saxicola leucomela), Eremophila a. atlas, very abundant, breeding and forming 99% of the whole of its bird-population (numerically Sparrows (?sp) very numerous.

On the larger Volcanic Kopjes (cones) and in the Largest Craters (wooded) bird-life much the same as the upper parts of the North Slope of the Range, or at its "crest".

PHYSICAL

The external physical features, principally the Vegetation, is indicated in a general way. Except in the Middle-Atlas and the Forest of Mamora, the features distant from the "Route" are only such as could be observed in transit.

The great Maritime-Plain is level for a number of miles inland thence undulates towards the foothills. The Forest of Mamora covers some 500 square miles of this - is, speaking generally, dry forest, mainly of cork-oak with a sprinkling of deciduous oak (R. bellota) wild-pear etc. Glades & clearings are numerous. Much of the remainder of the Maritime Plain is cultivated, and much is a waste of palmetto & other scrub.

Large, dry, poor-soil plains, covered with palmetto scrub, esparto grass and rank herbage - with few dwarfed cistus, lentisk &c bushes.

Ziziphus & lentisk bushes, cactus & xerophytic plants. Generally speaking of a more African character of vegetation than that of any other zone in this part of Morocco.

Monotonous rolling hills with great stretches of cultivation. Seldom a broken top-ped hill. Those hills too broken or stony to be cultivated are clad with a poor Mediterranean-like scrub.

The Plain rises gradually from Fez-Meknes to the El-Hajeb Plateau. The Northern parts and the vicinity of the ouads are much cultivated towards the South these give way to great stretches of palmetto scrub.

Very stony, and large slabs of bare rock frequent. Where it exists, the soil is comparatively moist. Large areas of thistle and esparto. Some good pasture. Towards the South edge of Plateau the Hex-treas of the "North Slopes" which round the head of Tigrigra Valley and degenerate into "bushwood".

Thick primeval forest-zone, moist and essentially "cool temperate" Flora. Trees chiefly Ilex and Quercus bellota 4700 - 5200 ft; then Commence Cedars (C. atlanticus) which gradually replace the other species, from the Crest's onto the Plateau. Some maple in Upper Zone. Shrubs:- Laurustinus, Holly and Cytisus battendieri mostly; Viburnum, Pyrus, Prunus, Hawthorn (much mistletoe) re se frequent. Flowering plants conspicuous and abundant are:- large pink Paeonies, Solomon's Seal, several other Lilaceae, Hairbell, Foxglove, Iris, Ranunculus, Daisies, Thistles, Labiatae, Umbelliferae, Leguminosae, Cruciferae, Caryophyllaceae, Rosaceae, Gentians, Violets, Primulas, Saxifrages, Cistus, Helianthemum, Ferns, Mosses, Lichens, Fungi, etc. Rain fall greatly in excess of the Terrasse lying to North and West.

The "Plateau" is an almost dead-level plain, in winter with numerous "dayas" (or shallow lakes ponds) in summer with rich pasture (except only on the dry floors of the dayas) and occasional volcanic boulders. "volcanic kopjes" and "craters". The "volcanic kopjes" are ancient volcanic cones with shallow or imperfect craters. Stand up to 300 feet above the floor of the Plateau, and are of two types - bare ... or crowned with Cedars. The latter type is most plentiful towards the N. edge of the Plateau.

The "Craters" are without "lip" or trace of ejected material, and are, so to speak, cleanout holes in the flat plain: the larger craters are clothed with Cedar-coppice, the smaller are bare or only clothed with grass or small bushes.

SOIL

The general nature of the Surface of the country is indicated.

Near the coast mostly fertile - big + humic near O. Sebu and marshes. Forest of Mamora has a light sandy soil.

Chiefly sandy and probably calcareous in many parts.

Sandy, stony, calcareous

Soil mostly light, fertile calcareous or rocky and stony occasional.

Soil rather fertile especially near bushy ravines or rocks or stones to speak of.

Tirasse limestone tabular formation. Rocky, stony, comparatively little earth - dark, reddish clay-like.

Upper parts mainly Jurassic limestone - lower down occur jasper chalcedony &c. at foot clay-slate

Surface of Plateau of volcanic tufa and basalt with thin layer of volcanic soil. "Volcanic Kopjes" mostly of scoriaceous lava. The craters basalt of columnary or trap formation - the larger craters have sometimes vertical walls of considerable height.

PROFILE

This "Profile" is a "Section" along the Route as travelled by author and is, to all intents & purposes, a projection from the "MAP" below it.

Some surface features are shewn:- in Black if close to & within a mile or two of the Route. in Blue if distant & more than ditto & (in Red) if beyond is to NE of the Route (in Red) if on the side is to SE " " " " at the distance (miles) indicated by the blue figure.

NOT VISITED BY THE AUTHOR

← No external physical features (Tolat Ouachi 11 W SW) are shewn to the S. and E. of this line which was the author's furthest South.

VERTICAL FEET 13,000 12 11 10,000 9 8 7 5,000 4 3 2 1 0

SCALES HOR.L (straight lines) 0 1.0 2.0 3.0 4.0 5.0 MILES

FEET 13,000 12,000 11 10,000 9 8 7 5 4 3 2 1 0

9800ft 7500ft 5900ft 4250ft 3000ft

GREAT PLAIN OF MAROCCO FOOT-HILLS PLAIN OF FEZ-MEKNES PLATEAU OF EL-HAJEB TIGRIGRA VALLEY NORTH SLOPES PLATEAU MAIN CHAIN VALLEY OR MLAVIA SLOPE TO SAHARA DESERT

MIDDLE-ATLAS RANGE → GREAT-ATLAS RANGE →

Rabat. Kenitra. Atlantic Ocean. Dar bel Hamri. O. Beht (Trib. of O. SEBU). Meknes. Ito. Casba el Hajeb. O. Tigrigra. Arrou. Timadit. O. Guigou. O. M'Louya. Pass of Tizi n Tebremt. Rich.

MAP

HEIGHTS - FEET 9800 7500 5900 4250 3000 1000 0

SCALE = 1 1,500,000 (ditto Profile)

TREES thus:- Cedar T Ilex (big, small) Cork (big, small)

SPAIN ATLANTIC OCEAN MEDITERRANEAN SEA ALGERIA MAROCCO SAHARA DESERT Tangier Tetuan Oran Melilla Casablanca Mogador Fez Taza Sale Rabat Kenitra Meknes El Hajeb Ito Azrou Timadit Ain Leuh Guigou Dar bel Hamri Oulmes Tadla Beni Mellal Tiflet Petitjean Port Lyautey Larache O. Beht O. Sebu FOREST OF MAMORA PLATEAU OF EL-HAJEB MIDDLE ATLAS ATLAS Causba el Mahboubene O. M'Louya Pass of Tizi n Tebremt Rich Ksar es Souk Tafilet

NE TRUE N W S

VITTY & SEABORNE, LTD LONDON

EXPLANATION OF PLATES.

III. (*a*) Azrou, general view.
(*b*) Azrou, showing a "Mamelon."

IV. (*a*) In the lower Forest, Middle-Atlas.
(*b*) Middle-Atlas Forest, showing nest of Golden Eagle.

V. (*a*) "Col" in upper Forest, Middle-Atlas.
(*b*) In the upper Forest, Middle-Atlas.

VI. (*a*) Upper Forest, Middle-Atlas, general view.
(*b*) General view over the Middle-Atlas Forest.

VII. (*a*) The "Barrens," Middle-Atlas.
(*b*) The "Crest-mounds," Middle-Atlas.

VIII. (*a*) On the "Plateau," Middle-Atlas.
(*b*) — ditto —

IX. (*a*) Nesting site of Seebohm's Wheatear.
(*b*) Nesting site of Atlas Nuthatch.

X. (*a*) Nest of Atlas Shore-Lark.
(*b*) In the Forest of Mamora (maritime plain).

XI. Chart of Mauretania:—
(*a*) Geographic.
(*b*) Physical.
(*c*) Geologic (tectonic).

XII. Descriptive chart of the Middle-Atlas Range.

VI.—*Obituary.*

William Brewster.

William Brewster, a Founder of the American Ornithologists' Union, and at one time its President, died at his home in Cambridge, Massachusetts, on 12 July, 1919, in the sixty-ninth year of his age.

For nearly half a century, Brewster has been in the front rank of American Ornithologists. He was one of the founders of the Nuttall Ornithological Club of Cambridge, in which the American Ornithologists' Union had its origin, and was for many years its President. From 1880–87 he was assistant in charge of the birds and mammals of the Boston Society of Natural History; from 1885–1900 he served in a similar capacity in the Museum of Comparative Zoology